



IB MYP YEAR 5
ASSESSMENT TASK

Patterns in Probability

Mv. Millard

Subject:	Y10 <i>Standard</i> Mathematics	Name : (Class)	Kristy Fung () 10J
Topic:	Patterns in Probability		
Date of assessment:	Thursday 1 st December (session 2)		

- This task assesses Criteria B and C
- Time allowed – *one hour*
- Write your answers on the file paper provided. GDCs are allowed.

ADVICE:

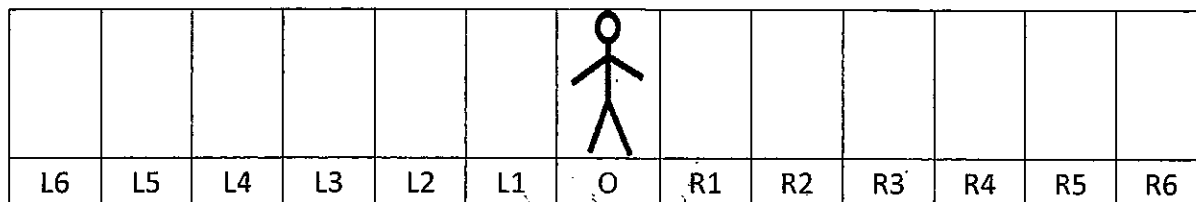
Read the criteria descriptors and task-specific clarifications carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.

Criterion B		
Levels	Task-Specific Clarification	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	You are able to answer the early questions, and order your answers in a way that reveals patterns.	The student applies, with some guidance , mathematical problem-solving techniques to recognize simple patterns.
3-4	You develop appropriate systematic methods in order to answer the questions. The results you get help you to suggest a mathematical pattern or patterns.	The student applies mathematical problem-solving techniques to recognize patterns, and suggests relationships or general rules.
5-6	You continue with the questions, and use some of your answers as a check on your findings. You need to have Q8 correctly answered to achieve a mark in this band.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, and draws conclusions consistent with findings.
7-8	You can justify/prove your answers to questions 7 and 12.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, draws the correct conclusions consistent with findings, and provides justifications or a proof .

Criterion C		
Levels	Task-Specific Clarification	Official IB Descriptors
0	The student does not reach a standard described by any of the descriptors given below.	
1-2	The narrative is basic. Mathematical symbols are used, perhaps with <i>some</i> errors or inconsistencies.	The student shows basic use of mathematical language and/or forms of mathematical representation. The lines of reasoning are difficult to follow .
3-4	The narrative is reasonably easy to follow. Mathematical language is used in a generally accurate way. Mathematical notation is used with few errors.	The student shows sufficient use of mathematical language and forms of mathematical representation. The lines of reasoning are clear though not always logical or complete . The student moves between different forms of representation with some success .
5-6	The narrative is easy to follow. Mathematical arguments are presented logically. Mathematical vocabulary and notation are used accurately and appropriately.	The student shows good use of mathematical language and forms of mathematical representation. The lines of reasoning are concise, logical and complete . The student moves effectively between different forms of representation.

A Random Walk

Throughout this task, you are strongly advised to write probabilities using fractions, rather than decimals or percentages.



A man stands at O and tosses a coin. If the coin lands on Heads he moves one step to the right (in the R-Direction). If the coin lands on Tails, he moves one step to the left (in the L-Direction)

1. How many different positions could the man occupy after 1 toss of the coin? Name these positions and find the probability of him being in each of them.

The man tosses the coin for a second time, with the same rule applying (Heads means he moves one step to the right, Tails means one step to the left).

2. How many different positions could the man occupy after 2 tosses of the coin? Name these positions and find the probability of him being in each of them.

The man continues with the coin-tossing and the moving.

3. How many different positions could the man occupy after 3 tosses of the coin? Name these positions and find the probability of him being in each of them (note: there may be more than one way in which the man can end up at a given position)

4. How many different positions could the man occupy after 4 or 5 tosses of the coin? Name these positions and find the probability of him being in each of them.

5. Summarise your results in an appropriate diagram or chart and comment on any patterns that are evident.

6. Based on your results, or otherwise, how many positions could he occupy after n tosses of the coin?

7. Prove or justify your answer to question 6

8. Based on your response to question 5 predict the probability the man lands at R4 after 8 tosses of the coin.

9. What is the most likely finishing position after 4 tosses? Explain your answer

10. What is the most likely finishing position after 6 tosses? Explain your answer

11. What is the most likely finishing position after an even number of tosses?

12. Prove/Justify your answer to Q11.



Assessment: Patterns in Probability.

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- After one toss of the coin there are 2 different positions for the man. It should be R1 or L1.

$$\frac{1}{2} \text{ H}$$

There are $\frac{1}{2}$ of the probability for him to be in each of them

$$\frac{1}{2} \text{ T}$$

- There are 3 positions for the man after 2 toss of the coin.

$$\begin{array}{c} \frac{1}{2} \text{ H} \begin{array}{c} \frac{1}{2} \text{ H} \\ \frac{1}{2} \text{ T} \end{array} \\ \frac{1}{2} \text{ T} \begin{array}{c} \frac{1}{2} \text{ H} \\ \frac{1}{2} \text{ T} \end{array} \end{array}$$

R2, L2 and O. Which to go to R2 the man will need to toss HH.

$$P(L2) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

To go to L2 will need TT

$$P(R2) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

To go to O will need HT or TH

$$P(O) = \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{2} \leq 1$$

-

$$\begin{array}{c} \frac{1}{2} \text{ H} \begin{array}{c} \frac{1}{2} \text{ H} \\ \frac{1}{2} \text{ T} \end{array} \\ \frac{1}{2} \text{ T} \begin{array}{c} \frac{1}{2} \text{ H} \\ \frac{1}{2} \text{ T} \end{array} \end{array}$$

Results

HHH \rightarrow R3

There are total 4 position that

HHT \rightarrow R1

the man could occupy which is R1, R3,

HTH \rightarrow R1

L1 and L3.

HTT \rightarrow L1

$$P(R1: HHT, HTH, THH) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

TTH \rightarrow R1

$$+ \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

THT \rightarrow L1

$$= \frac{3}{8}$$

TTH \rightarrow L1

$$P(R3: HHH) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$$

TTT \rightarrow L3

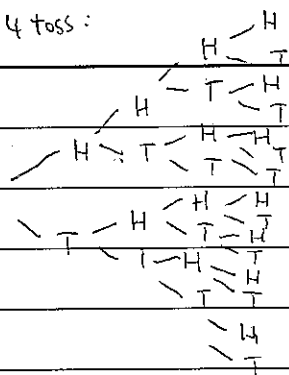
$$P(L1: HTT, THT, TTH) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} +$$

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{3}{8}$$

$$P(L3: TTT) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$$

$$\frac{3}{8} + \frac{1}{8} + \frac{3}{8} + \frac{1}{8} \leq 1$$

4 toss:



Results

HHHH $\rightarrow R4$

THHH $\rightarrow R2$

HHHT $\rightarrow R2$

TTHH $\rightarrow 0$

HHTH $\rightarrow R2$

THTH $\rightarrow 0$

HHTT $\rightarrow 0$

THTT $\rightarrow L2$

HTHH $\rightarrow R2$

TTTH $\rightarrow 0$

HTHT $\rightarrow 0$

TTHT $\rightarrow L2$

HTTH $\rightarrow 0$

TTTH $\rightarrow L2$

HTTT $\rightarrow L2$

TTTT $\rightarrow L4$

There are 5 positions for the man to occupy after 4 toss.

$R4, R2, 0, L2, L4$

$$P(R4) : \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$$

$$P(R2) : (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) \times 4 = \frac{1}{4}$$

$$P(L4) : \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$$

$$P(L2) : (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) \times 4 = \frac{1}{4}$$

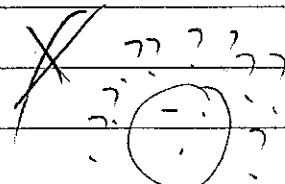
$$P(0) : (\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}) \times 6 = \frac{3}{8}$$

5. From the results that I get I see that if the number of toss is made the position should be L or R the number then other win be the number - 1 and 0.

6. The number of position will be $(n+1)$.

7. Because from all the results I got from above all is the number of toss plus one will be the number of position.

8. The possibility will be $\frac{1}{4}$ of the number results.



[illegible]



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9. The most likely finishing position after 4 tosses will be 0. Because from my results $\frac{12}{18}$ of the probability will be on 0.

10. It will be 0 after 6 tosses because from the result the number of hitting 0 will increase.

11. 0

12. To the even number of toss all it will be 0 is getting most likely is 0 if the even number is getting bigger.